FEDERAL AID FINAL RESEARCH PERFORMANCE REPORT

Alaska Department of Fish and Game
DIVISION OF WILDLIFE CONSERVATION
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PROJECT TITLE: Summer habitat selection by female sharp-tailed grouse in Interior Alaska

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I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH

The U.S. Army is responsible for protecting, conserving, and restoring natural resources, training areas and range facilities on all Army-administered lands in Alaska. In recent years on private agricultural land near Delta Junction, landowners have begun reclaiming fallow fields formerly in the Conservation Reserve Program for crop production (cutting shrubs and young trees and plowing) and expanding the area of fields in production by removing long-established wind breaks composed of forest debris (burn piles from earlier land clearing) and natural forest within fields. This practice may be reducing the quality of habitat for the northern-most subspecies of sharp-tailed grouse (*Tympanuchus phasianellus caurus*) by removing cover for escape, foraging, resting, and nesting within the agricultural area. Females use nest sites that conceal them from predators and brood rearing areas with abundant insects that offer summer forage for young chicks and production of berries and fruits in the fall. If a decrease in old fields and forest patches continues on agricultural lands, the natural maintenance of early seral habitats by mechanical clearing, prescribed fire, or wildland fire on the adjacent Donnelly Training Area (DTA) of Fort Wainwright may become increasingly important to local sharp-tailed grouse from spring through early fall. The U.S. Army seeks to understand habitat use by sharp-tailed grouse on military lands near Delta Junction, particularly during the nesting and brood rearing period, to understand potential effects of land management practices and military training activities on sharp-tailed grouse.

II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED

Sharp-tailed grouse breeding occurs on male display grounds (also called leks or arenas) on slightly elevated open habitats of grassland or open woodland with low shrubs. Leks tend to have nearby escape and roosting cover for females. Females tend to nest and rear young away from displaying males, presumably to reduce predation risk associated with conspicuous calling and visual displays of males in spring and early summer (Gratson 1988). Brood breakup and juvenile dispersal occurs in mid- to late summer as juveniles reach adult size and become independent from adult hens (Gratson 1988).

Few studies have been conducted on the northern-most subspecies of sharp-tailed grouse, which in Alaska occur from the Copper River basin throughout the Interior and west to the Seward Peninsula. Sharp-tailed grouse are often associated with open habitats and early post-fire seres or agricultural clearings in forested regions of Interior Alaska (Weeden 1965). Productive habitat for sharp-tailed grouse associated with agricultural lands near Delta occurred where native vegetation remained beneath windrows of cleared debris, which provided nesting cover and wild fruit in forest understory. Kessel (1981) noted the Alaska subspecies of sharp-tailed grouse seemed to be more tolerant of shrubs and trees (potential concealment cover) than subspecies found at lower latitude, and it commonly used leks in recent burns and natural clearings and at sites disturbed by human activities (e.g., agricultural fields and clearings for roads and utility corridors).

Raymond (2001) conducted the only prior telemetry study of sharp-tailed grouse in Alaska, which occurred on agricultural lands near Delta Junction during 1998–2000. He documented habitat use and movements, including migration outside the agricultural area to winter range dominated by dwarf birch (*Betula glandulosa*), a common winter forage. Goddard et al. (2009) recently studied habitat selection by female sharp-tailed grouse in agricultural lands with interspersed shrub and forest in eastcentral British Columbia. They found that female sharp-tailed grouse selected for shrub-dominated habitat during nesting and brood rearing, potentially in response to conversion of native grassland to agriculture.

III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED

Our primary goal in this pilot study was to assess feasibility of capturing sharp-tailed grouse on spring leks and to document habitat selection by hens with broods on the DTA during spring and summer 2010. We assumed that habitat selection by grouse during nesting and brood rearing would be influenced primarily by predation risk and secondarily by forage abundance conducive to growth and fledging by chicks. Thus, we hypothesized that female sharp-tailed grouse on nests and with broods would select areas with greater overhead and lateral concealment cover from terrestrial and avian predators than males or females without broods.

OBJECTIVE 1: Define habitats selected by female sharp-tailed grouse in southwest GMU 20D during summer for 3 critical periods (mating, nesting, brood-rearing).

JOB/ACTIVITY 1A: <u>Capture and radiotag up to 30 sharp-tailed grouse in spring 2010</u>.

A field crew composed of ADF&G, Army, and Colorado State University (military lands contractor) personnel, and volunteers began livetrapping efforts on 12 April 2010. Birds were captured in non-baited pens on primarily 2 major breeding leks. Males were initially banded on one leg with colored rings for visual detection to verify movement among leks or recapture but were not radiomarked. However, we had low capture success on females (due to low population abundance) and began putting radios on both sexes in late April. We captured 46 individual grouse (32 males and 14 females) and fitted 17 males and 12 females with radio collars by 24 May 2010.

JOB/ACTIVITY 1B: Radiotrack female grouse 3 times weekly and males once weekly during May through August to determine habitat selection. Weekly visual observation of nests and broods will be attempted to determine habitat associations and obtain accurate GPS locations. Searches for missing birds will occur during telemetry flights in conjunction with ongoing moose research in the area.

Telemetry occurred during 24 May to 6 October 2010. Bird locations to 23 September (end of brood rearing) were estimated 403 times with telemetry and confirmed an additional 64 times by telemetry leading to direct observation or flushing. Searches by aerial telemetry were infrequent: twice in 2010 (general locations only to aid ground telemetry) and once in 2011 (no birds found).

OBJECTIVE 2: Determine survival of female sharp-tailed grouse and their broods.

JOB/ACTIVITY 2A: Radiotrack marked females to check brood size and survival of young and hens.

Nesting females were visited to verify hatch, and females with broods were observed (see Job 1B).

JOB/ACTIVITY 2B: Estimate spatial error of ground telemetry by GPS when radiomarked birds are observed in the field or dead birds are recovered.

Error estimates based on intersection of angular bearings were an order of magnitude smaller than size of the average cover polygon in the cover classification.

OBJECTIVE 3: Determine movements of male sharp-tailed grouse between leks.

JOB/ACTIVITY 3A: Male sharp-tailed grouse captured on leks will be radiomarked. Observations and captures of marked grouse will be recorded at leks during the spring capture season.

We captured 8 males and 2 females more than once (1 male 3 times and 1 male 5 times), but only 3 males were recaptured at an associated secondary lek (used less frequently) at 0.16 and 1.2 km distance from the primary lek. Field crews did not conduct frequent telemetry during trapping, so we could not discern male or female movement among satellite leks at each of the 2 main leks. Telemetry data indicated that no birds moved between the 2 main lek complexes (ca. 10–12 km) during the remainder of the study period (May–September).

OBJECTIVE 4: Data analysis and report writing.

JOB/ACTIVITY 4A: Movements of each marked grouse will be plotted on the ecological land classification along with any infrastructure requested by the military.

A plot of locations and the minimum convex polygon representing spatial use of habitat was produced for each bird with ≥20 locations.

JOB/ACTIVITY 4B: Staggered entry survival rate will be estimated.

Raptor predation was confirmed or suspected in 7 of 9 mortalities (along with 1 by mammalian predator and 1 of unknown cause) with 2 events censored. We defined biological periods (displaying 14 April–16 May, nesting 17 May–23 June, and brood rearing 24 June–20 September) to estimate period survival for 17 males and 11 females (excluded 1 female where predation was likely capture related). The analysis period spanned from first capture date through last date all remaining birds were confirmed alive by observation or movement prior to end of telemetry (when all broods were dispersed). Male survival was 0.8 across all periods whereas female survival was 0.64 during displaying and 0.53 in subsequent periods. Small sample sizes limit sex-specific inference on survival rate.

JOB/ACTIVITY 4C: Habitat selection will be analyzed at the stand scale (within individual female range) and landscape scale (polygon of all female ranges).

We estimated selection indices for ecotype classes grouped into 4 vegetative types (grassland, low scrub, tall scrub, forest) for males and females at both spatial scales. Substantial overlap in home range among males and among females at each lek resulted in little landscape scale inference. Within home ranges, both sexes tended to select forest less than other types, but further inference was confounded by the strong difference in habitat composition of each primary lek (forest in one and grassland in the other).

JOB/ACTIVITY 4D: Final report summarizing main results will be written.

A final research technical report is anticipated to be completed by 30 September 2011; the completion date is contingent on receiving a revised vegetative classification for the study area being completed for the Army so bird location plots (Job 4B) and habitat selection (Job 4C) can be revised from preliminary analyses in the progress report (see Section VI, Job 4D). Telemetry and habitat data and results of analyses will be archived in electronic format on DVD by the lead author, and a copy will be provided to the U.S. Army with the final technical report.

IV. MANAGEMENT IMPLICATIONS

In lieu of further field studies to assign fitness of sharp-tailed grouse to specific habitat types in the DTA, we can infer the reproductive component of fitness is represented by consistently or heavily used leks (Giesen and Connelly 1993). These authors recommended that disturbance at leks by physical, mechanical, or audible means should be avoided within 3 hours of sunrise and sunset during the breeding season (late March to early June). Peak display occurs from mid-April to mid-May near Delta.

Sites with recently disturbed vegetation seemed to function as displaying grounds near Delta (Kessel 1981), presumably as long as human activity or other disturbance does not disrupt lekking activity (Baydack and Hein 1987). Prescribed fire to mitigate hazardous fuels should ideally occur prior to commencement of peak lekking in mid-April to avoid disruption of breeding and certainly prior to mid-May to avoid destruction of nests. Prescribed fire would be less of a temporal conflict in years of low snow accumulation that allow fine fuels to dry earlier in spring (grouse display activity is presumably entrained to photoperiod although affected daily by weather). Giesen and Connelly (1993) defined a 2-km radius around leks as the breeding complex and recommended that vegetative manipulation be avoided in this area to avoid potentially reducing cover used during nesting and brood rearing. The 7 nests we documented were ≤1.3 km from their associated breeding leks, and 4 females observed with broods were ≤1.6 km from associated leks. Although fire or mechanical treatments on vegetation may actually increase potential lek habitat near Delta, we recommend avoiding human-caused disturbance at existing leks during breeding to minimize displacement of females and avoiding extensive vegetative disturbance within 2 km of existing leks to maintain cover for nesting and brood rearing.

V. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN FOR LAST SEGMENT PERIOD ONLY

JOB/ACTIVITY 1B AND 2A: We relocated birds by radio triangulation from the ground until 16 September 2010 when unmarked broods were indistinguishable from marked females and birds began to form flocks. Birds were infrequently relocated from the ground during fall and winter (cold temperatures reduced transmitter signal strength and birds moved to less accessible winter range). A telemetry flight on 7 March 2011 during a relatively warm period failed to relocate birds. Leg-banded males and instrumented birds were observed during lek surveys in late April 2011, but no signals were heard, which confirmed that transmitter battery life expired.

JOB/ACTIVITY 2B: In addition to estimating error associated with ground telemetry based on angular bearings, we directly estimated spatial error of ground telemetry for the 2 primary field crews by using blind trials with dummy transmitters.

JOB/ACTIVITY 4A: Bird locations were analyzed relative to ecotype classification, and a plot on the revised classification will be produced in the final technical report (see Job 4D).

JOB/ACTIVITY 4B: A table of capture dates, assignment of fate, and date of mortality was prepared for survival analysis by individual for estimating spring to fall survival rate for radiomarked adults by sex as a function of the length of period exposed to mortality causes.

JOB/ACTIVITY 4C: We estimated bird location and error ellipse using telemetry software and extracted the associated cover type for the point location and ellipse from a geo-referenced ecotype classification using a geographic information system (GIS). Based on our findings for relatively low spatial error (Job 2B), we compared the proportional measure of habitat use at point estimates (rather than error polygons) to the proportion available by cover type at the appropriate scale to calculate selection indices.

JOB/ACTIVITY 4D: A technical progress report was produced for the U.S. Army (contract W912CZ-08-D-0012, Delivery Order #7) on 30 June 2011.

VI. PUBLICATIONS

A poster on the study design and data collection was presented by J. Mason at the 14th Alaska Bird Conference in Anchorage, November 2010.

VII. RESEARCH EVALUATION AND RECOMMENDATIONS

The number of birds in the study area during this pilot study in 2010 was relatively low compared with Raymond (2001) and recent knowledge of sharp-tailed grouse abundance in the area (W. Taylor, personal communication). Potential to trap and mark a larger sample of females (e.g., ≥30) should be higher before further efforts are put into a study of nesting ecology. However, understanding population dynamics and importance of habitats used by sharp-tailed grouse in this study area will ideally require research at the scale of the vegetation-disturbance matrix that includes both the study area and the adjacent Delta agricultural project to identify potential existence of population sources and sinks (Pulliam 1988). Raymond (2001:26) showed winter range use by birds marked in the agricultural area that overlapped both primary leks in the study area. Attempting to infer effects of vegetation management practices on grouse habitat use or reproductive success in either area in isolation of the other could lead to spurious conclusions if there is substantial exchange of individuals between the 2 areas among years.

Habitat selection by individuals and density among habitats are indications of habitat importance to life requisites for a species, but fitness is the ultimate validation of critical habitat (Van Horne 1983). Future study of fitness across leks and estimating habitat selection at that order of landscape scale may be sufficient to evaluate effects of land management in the DTA on sharp-tailed grouse fitness. Going to finer levels of habitat selection on individual birds requires substantial labor in the field (number of birds and relocation frequency) plus data analysis. Estimating fitness by lek would require radiomarking a much larger sample of hens among several leks but only periodically determining hatch success, brood survival, and fledging by telemetry-aided observation. Further inquiry into whether this would ideally require radiomarking chicks (expensive and labor intensive) or use of trained dogs for brood surveys is warranted. The challenge of accessing multiple leks and capturing an adequate sample of females in spring will likely be the primary limitation in this study area. Specific questions regarding land management decisions (e.g., potential effect on sharp-tailed grouse of modifying vegetation in a specific habitat type or on a known lek) and the desired level of inference (chance of making an incorrect decision that could reduce breeding success on a lek and potentially reduce sharp-tailed grouse abundance on the DTA) should be discussed with a biometrician when planning future studies so logistical and sample size requirements are clearly defined.

VIII. LITERATURE CITED

BAYDACK, R. K., AND D. A. HEIN. 1987. Tolerance of sharp-tailed grouse to lek disturbance. Wildlife Society Bulletin 15:535–539.

GIESEN, K. M., AND J. W. CONNELLY. 1993. Guidelines for management of Columbian sharp-tailed grouse habitats. Wildlife Society Bulletin 21:325–333.

GODDARD, A. D., R. D. DAWSON, AND M. P. GILLINGHAM. 2009. Habitat selection by nesting and brood-rearing sharp-tailed grouse. Canadian Journal of Zoology 87:326–336.

GRATSON, M. W. 1988. Spatial patterns, movements, and cover selection by sharp-tailed grouse. Pages 158–192 *in* A. T Bergerud and M. W. Gratson, editors. Adaptive strategies and population ecology of northern grouse. University of Minnesota Press, Minneapolis. 809 p.

KESSEL, B. 1981. Ecology and behavior of sharp-tailed grouse as related to potential impacts of the Northwest Alaskan Gas Pipeline in interior Alaska (a literature review). College, Alaska. 48 p.

PULLIAM, H. R. 1988. Sources, sinks, and population regulation. American Naturalist 132:652–661.

RAYMOND, R. L. 2001. Use of summer and winter habitat by Alaska sharp-tailed grouse (*Tympanuchus phasianellus caurus*) in eastern interior Alaska. Master's thesis, Alaska Pacific University, Anchorage, Alaska. 61 p.

VAN HORNE, B. 1983. Density as a misleading indicator of habitat quality. Journal of Wildlife Management 47:893–901.

WEEDEN, R. B. 1965. Grouse and ptarmigan in Alaska: their ecology and management. Alaska Department of Fish and Game. Federal Aid in Wildlife Restoration. Volume V, Project W-6-R-5, Work Plan I. Juneau, Alaska. 110 p.

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